WORKING PAPER

Summary of British Columbia Forest Inventory Statistics by Land Administration Class

Volume 3. Nelson Forest Region

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Province of British Columbia
Ministry of Forests Research Program

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This Research Program Working Paper is an internal report of interim research results with field applications. It is intended to generate discussion and general feedback.

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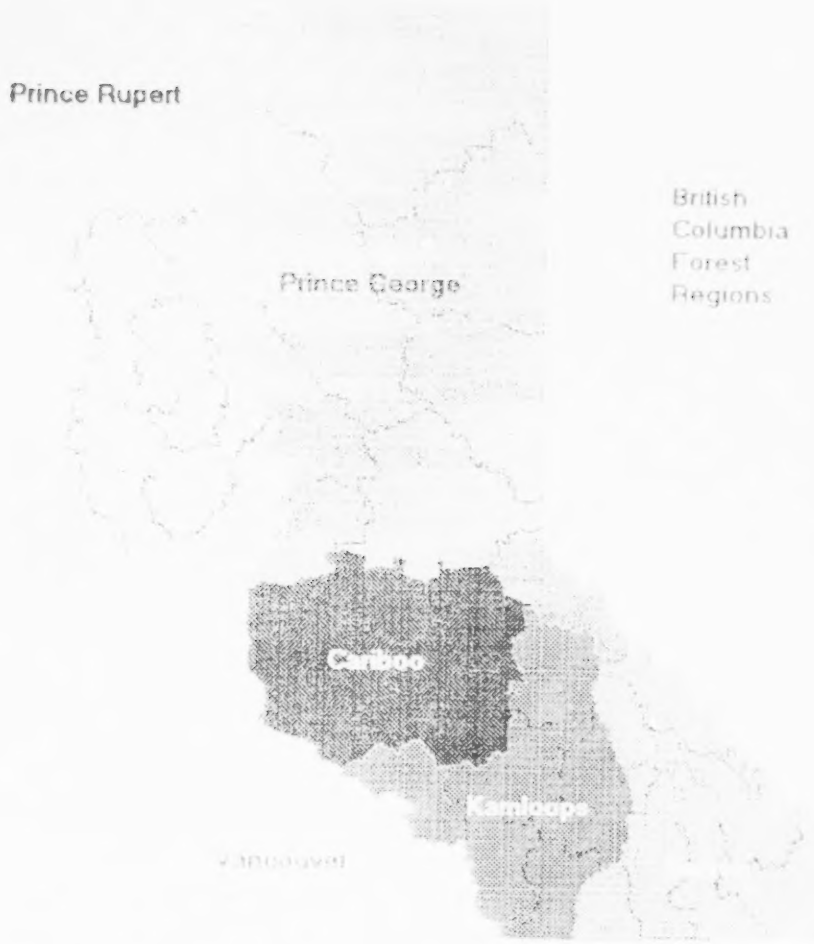
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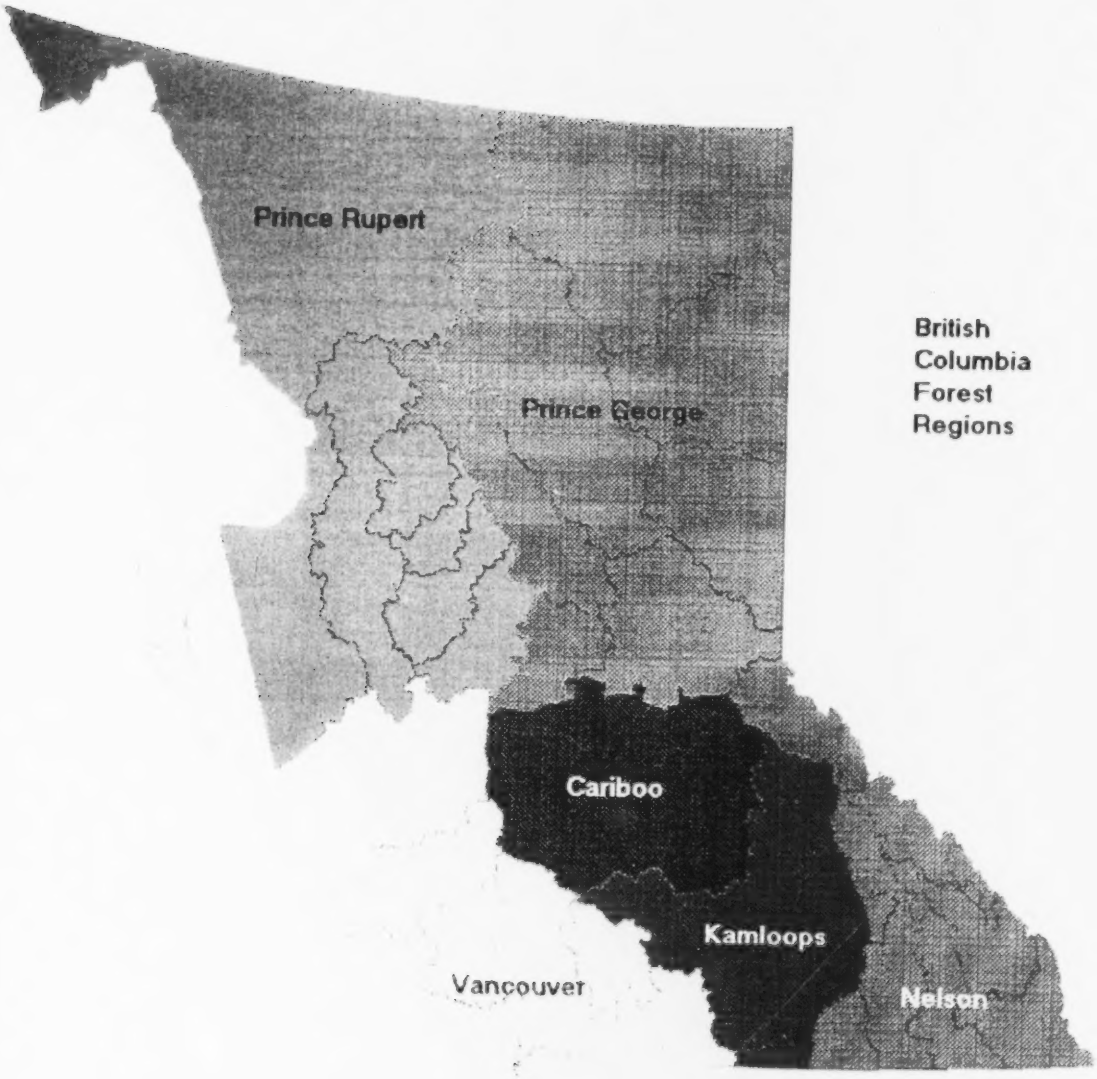

British Columbia Forest Regions

INTRODUCTION

This report provides current, comprehensive, and easy-to-read forest resource statistics for anyone interested in the forest resources in the Province of British Columbia.

The Ministry of Forests' Resources Inventory Branch compiles and maintains forest inventory information (statistics and maps) for all land in the province. This includes federal lands within Timber Supply Areas (TSAs). On Tree Farm Licences (TFLs) the licensee is required to perform the inventory and provide the data according to a standard set by the Forest Service.

Forest cover data are obtained at district and regional levels and are linked with geographic data (base maps, ownership and administrative boundaries) to produce an inventory/database that provides information on the location, areal extent, physical characteristics, and condition of the forest.

The Forest Inventory Program currently maintains approximately 7,000 map sheets at 1:20,000 scale that describe forest, range, and recreation resources. Map sheets are updated for changes every 2 years (Forest Inventory Manual 1992). With the exception of managed forest units, timber inventories are not available for most private land (Determining the Accuracy of Forest Inventories 1993).

Organization of the Report

For administrative purposes, British Columbia is divided into six Forest Regions: Cariboo, Kamloops, Nelson, Prince George, Prince Rupert, and Vancouver. Each region is, in turn, divided into districts.

The information in this report has been organized into six volumes, one volume per Forest Region.

Four reports have been generated for each Timber Supply Area (TSA), Tree Farm Licence area (TFL), and protected area of more than 100 hectares within each Forest Region. Each volume has been subdivided into sections by TSA for areas within TSA boundaries and by TFL or protected area for areas outside TSA boundaries.

Report 1 presents area and volume data for each inventory type group by age class and height class.

Report 2 summarizes area and volume data for all ages by inventory type group by height class.

Report 3 presents area and volume data for all inventory type groups older than 120 years by height class.

Report 4 presents "old-growth" area and volume data by height class for:

- stands with lodgepole pine, whitebark pine, and deciduous species leading older than 120 years (age classes 7, 8, and 9).
- stands of all other coniferous species older than 140 years (age classes 8 and 9).

CONTRIBUTORS

Andy MacKinnon, Research Branch: project leader.

John Brodie, Resources Inventory Branch: assembly and conversion of inventory data, and supervision and assistance with creation.

Marta Buckiewicz and Terry Hamelin, Camosun College co-op students: organization and tabulation of the data. (Marta Buckiewicz also wrote the introduction and assisted in assembling the final report.)

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HISTORY OF FOREST INVENTORY IN BRITISH COLUMBIA

Inventory of the forest resource has been an ongoing process since the Forest Service was established in 1912.

Early inventories were based on military reconnaissance surveys. Estimates of volume were made by drainage basin and Forest District (roughly coincident with present Forest Regions).

Procedures and standards have changed substantially since that time.

The first complete inventory of the province, which took place from 1951 to 1957, was intended to provide average statistics for groupings of similar forest types. Sampling was performed in accessible areas and broad forest classification was done through interpretation of aerial photographs (Forest Inventory Manual 1992).

Most of the volume data in the inventory database were collected during the survey done from 1961 to 1977. Aerial photos, supported by stand estimates from helicopter and ground measurements, were used in estimating forest attributes. The major sampling units were management areas referred to as Public Sustained Yield Units (PSYUs). More detailed forest classification was possible due to improvements in the quality and scale of aerial photos. The program was also expanded to identify environmentally sensitive areas (ESAs).

In 1978, inventory standards and procedures were revised to reflect the need to provide more descriptive statistics for smaller geographic areas. The existing database was re-organized to accommodate the switch from Imperial measure to metric and the replacement of Public Sustained Yield Units with Timber Supply Areas (Forest Inventory Manual 1992).

Computerized mapping systems were introduced at this time and the process of converting the map sheets to a digital format was initiated.

Forest inventories continue to depend primarily on aerial photography supported by ground sampling. Growth and yield models are used to estimate timber volumes, and satellite imagery is used to update depletions resulting from harvesting, fire, and damage by insects and disease.

All files in the database used to generate this report have been updated since 1990. Files referred to as "other data" were projected to 1984 for parks and to approximately 1989 for TFLs.

LIMITATIONS OF EXISTING INVENTORIES

Park boundaries for recently created parks have not been digitized in the database. Through a 2-year update cycle, all new boundaries are digitized. Although detailed forest cover information may be reported for the park, it will be included in another administrative unit such as a TSA. Forest cover for some larger, older parks may exist in paper format, but may not be available in digital format.

Since the original survey, most park inventories have not been updated to reflect changes due to natural disturbances such as wildfire, insect damage, or disease.

Differences exist in inventory standards for inventories taken outside the direction of the Forest Inventory Program. Forest classification, and detail and scale of mapping, will vary for units not under forest management. For example, inventory information for federal parks is limited to generalized biophysical mapping, and information for specific forest groups is not available. Inventory data for private lands are largely unavailable.

LAND ADMINISTRATION IN BRITISH COLUMBIA

British Columbia is the third-largest province in Canada, covering an area of approximately 94.8 million hectares (British Columbia Land Statistics 1988).

Most of this land (93%) is publicly owned provincial Crown land. Federal lands consisting of National Parks, Aboriginal Reserves, and Department of Defence and Ministry of Transport lands cover 1% of the land base. The remaining 6% is privately owned (British Columbia Land Statistics 1989).

About 85% (80.7 million hectares) of British Columbia's total area is Crown land managed by the Ministry of Forests and designated as "provincial forest."

Of the areas designated provincial forest, 43.3 million hectares is productive forest land managed for timber production, recreation, and wildlife. The rest of the provincial forest is alpine, range, and water.

Only half of the productive forest is considered available and suitable for growing commercially harvestable timber. Forest land not presently productive includes areas that are inaccessible, environmentally sensitive, not satisfactorily restocked, or covered by noncommercial tree species.

Forest Tenures

In British Columbia, the right to harvest timber is usually allocated to individuals and forest companies by the provincial government in the form of timber tenures. To facilitate administration of these tenures, the province has been divided into management units referred to as *Timber Supply Areas* (TSAs) and *Tree Farm Licence* areas (TFLs).

In *Timber Supply Areas*, forest companies manage the timber resource according to resource management plans prepared by the Forest Service. The companies are granted the right to harvest a specified volume of timber annually through the issuance of several different types of timber tenures. Each type of tenure has its own specific forest management obligations.

A *Christmas Tree Permit* allows the use of Crown land for Christmas tree production.

The *Tree Farm Licence* (TFL) is an area-based tenure in which forest companies have been delegated "stewardship" responsibilities over an area with fixed boundaries. This includes the right to harvest a specified volume of timber annually and the obligation to carry out most of the forest management activities, which are monitored by the Forest Service. Licensees are required to submit a Management and Working Plan prepared by a Registered Professional Forester for approval by the Chief Forester. The Management and Working Plan must contain an inventory of the forest and recreation resources, a proposed annual cut, and proposals for the management and protection of those resources (Forestry Handbook for British Columbia 1983).

A *Woodlot Licence* is similar to a Tree Farm Licence, but the scale of operations is smaller. Any size of private land may be included in the licence, but the Crown land portion must not exceed 400 hectares. Woodlot licences have a term of 15 years and are replaceable every 5 years. As with TFLs, the licensee must submit a Management and Working Plan (Forest Management in British Columbia 1992).

Managed Forest Units are areas of private land that have been classed as "forest land" by the British Columbia Assessment Authority. If managed in accordance with an approved Management Working Plan, which includes an allowable cut and reforestation responsibilities, these lands become eligible for a lower tax assessment. Although forest inventories of these areas are included in the Management Working Plan, they are confidential.

Protected Areas

More than 8 million hectares of land have protected area status in British Columbia. Various levels of government and non-government organizations are involved in the management of these areas.

Management policies and the level of legislative protection received varies for each type of protected area. Some areas are strictly protected with no resource extraction or development permitted. Others allow various degrees of resource extraction such as mineral exploration and development (Protected Areas Strategy 1992).

Federal Programs There are six national parks covering more than 600,000 hectares in British Columbia; two, South Moresby National Park Reserve and Pacific Rim National Park Reserve, have a marine component. Although some biophysical mapping has been completed for several national parks, inventory information is very general and does not provide specific information with respect to the age and height of individual forest types. Detailed

inventories for national parks in the Nelson Region, for instance, are not available.

Two federal wildlife management programs, administered by the Canadian Wildlife Service, operate in the province: migratory bird sanctuaries and national wildlife areas. These areas are designated on both public and private lands and are generally small, covering a total of approximately 5,400 hectares. Most of these sites are located in wetland areas without significant forest cover.

Provincial Programs Most of the protected areas in British Columbia are administered by the Ministry of Environment, Lands and Parks. These areas, which encompass 6.6 million hectares, include provincial parks, recreation areas, wilderness areas, wilderness conservancies, and ecological reserves. Each of these areas is managed by a unique set of administrative conditions.

Class A Provincial Parks prohibit all commercial resource extraction. Special zoning within individual parks can limit access, facility development, and outdoor recreation.

Nature Conservancies within Class A parks are roadless areas reserved for the preservation of representative ecosystems and landforms in their natural state.

Class B Provincial Parks permit commercial resource extraction (i.e., mining).

Class C Provincial Parks are small community parks, often near urban areas, which are gradually being turned over to municipal and regional parks for administration.

Recreation Areas are lands held in park reserve for a minimum period of 10 years to permit mineral and energy resource evaluation. Following this assessment they may be recommended for upgrade to full protection status as Class A parks.

Wilderness Areas are areas of land, usually greater than 1,000 hectares, that retain their natural character and are relatively unaffected by human influences. These areas are designated and managed by the Ministry of Forests. Although commercial logging is prohibited, mining and other commercial activities may be allowed, provided they are compatible with the preservation of wilderness. Hunting, fishing, and trapping may also be permitted (Managing Wilderness in Provincial Forests 1992).

Wilderness Conservancies are roadless areas in which the natural and ecological communities are preserved. Commercial resource extraction such as mining and logging is prohibited, but hunting is permitted.

Ecological Reserves are protected natural areas intended primarily for scientific purposes and educational programs. These areas have been set aside to preserve rare, unique, and endangered native plants and animals in their natural habitats. Ecological reserves receive the highest level of protection and are the areas least subject to human intervention. All commercial and consumptive resource activities are prohibited. Public access is regulated

and recreation is limited to observational activities. Almost half the area protected as ecological reserves is marine or subtidal.

Wildlife Management Areas are lands administered by the Ministry of Environment for the protection of fish and wildlife. These sites are generally small and consist mainly of wetland or grassland habitats. Commercial resource extraction and development may be permitted.

FOREST CLASSIFICATION

Forest land is classified by biophysical characteristics that can be recognized and differentiated on aerial photographs. Land is divided into homogeneous strata based on a set of well-defined criteria, which can be recognized on aerial photographs with a minimum of ground control. Forest and non-forest types (polygons) are digitized and their respective descriptions are entered onto attribute files.

For inventory purposes, 28 commercial and 11 non-commercial tree species are recognized in British Columbia. A single, uppercase letter describes each genus and an upper- and lowercase letter describes the genus and species respectively.

The 28 commercial tree species are grouped into 42 associations or Inventory Type Groups (ITGs). These groups are assigned a numeric code and named according to the dominant or leading species represented in that area. A stand will occasionally contain two almost equal species. The resulting type group name then combines both the leading and secondary species (Forest and Range Resource Analysis 1984).

Inventory Type Groups with common leading species can be combined into growth types.

Growth types are defined as follows:

TYPE GROUPS	GROWTH TYPES
1 – 8	Douglas-fir
9 – 11	Western redcedar or yellow-cedar
12 – 17	Hemlock
18 – 20	True Firs
21 – 26	Spruce
27	Western white pine
28 – 31	Lodgepole pine
32	Ponderosa pine
33 – 34	Larch
35 – 42	Deciduous

Individual trees are aged based on ring counts. The age of a stand of trees is calculated as the average age, in years, of the dominant and co-dominant trees for the leading species. Even-aged stands will have small age differences (less than 20 years) between individual trees whereas uneven-aged stands will exhibit a variable age pattern. Stands are assigned an age class code from 1 to 9. From 1 to 7 the class intervals are 20 years. Age class 8 contains stands from 141 years to 250 years and age class 9 includes all trees older than 250 years.

AGE CLASS	AGE RANGE (Years)
1	1 – 20
2	21 – 40
3	41 – 60
4	61 – 80
5	81 – 100
6	101 – 120
7	121 – 140
8	141 – 250
9	251 +

Height or "top height" of a stand of trees is measured as the average height, in metres, of the dominant and co-dominant trees for the leading species. Stand height is an important measure of productivity and is strongly correlated with volume. The height range of a stand of trees is grouped into approximately 10-metre intervals, referred to as height classes.

HEIGHT CLASS	HEIGHT RANGE (Metres)
1	0 – 10.4
2	10.5 – 19.4
3	19.5 – 28.4
4	28.5 – 37.4
5	37.5 – 46.4
6	46.5 – 55.4
7	55.5 – 64.4
8	64.5 +

Although a single, generally accepted definition of old-growth forest does not exist, working definitions to identify old-growth forests are needed. Age and height are important structural criteria used in identifying mature and old-growth forests using the existing forest cover database (An Old Growth Strategy for British Columbia 1992).

Stands with lodgepole pine, whitebark pine, or a deciduous species leading are considered mature at 81 years. Otherwise, all stands with conifers other than lodgepole pine and whitebark pine as the leading species are mature when the stand age is greater than 120 years.

For this report, stands with most conifer species leading, greater than 140 years in age were considered old growth. Stands with lodgepole pine or deciduous species leading were considered old growth at more than 120 years of age.

Area is the land surface measured in hectares. One hectare (10,000 square metres) is equivalent to 2.4 acres.

Volume is the amount of wood in a tree, stand, or other specified area. The unit of measurement is cubic metres. As an example, there are about two and a half cubic metres in a telephone pole.

Volumes in this report are estimates only. More current volume calculations are used in inventory and planning for forest management purposes.

Volume may be a gross total, which is the volume of the main stem, including the stump and top as well as defective and decayed wood. Gross merchantable volume refers to the volume of the main stem, excluding the stump and top but including defective and decayed wood. Net merchantable volume is used in this report and includes the main stem and excludes a 30-cm stump, the top above a 10-cm diameter, and only includes trees with a diameter greater than 17.5 cm at 1.3 m above germination. An allowance is also made for decay, waste, and breakage. Volumes in this report were calculated using the projected age of the stand, its site index, and stocking class with coefficients based on the stand's geographic area and its inventory type group. Other coefficients based on location are used to determine utilization.

Volume per hectare refers to the volume of wood, less decay, waste, and breakage, per hectare, calculated for the specific area. In the following reports, volume per hectare was calculated to more significant figures than were the area and volume figures. On small areas, division may not result in identical numbers. Minor discrepancies in totals may also occur due to rounding error.

FUTURE OF FOREST INVENTORY IN BRITISH COLUMBIA

The Forest Resources Inventory is a dynamic inventory that will continue to develop and improve over time. The following is the Forest Inventory Program's vision for the future.

The Forest Resources Inventory, a geo-referenced repository of current and historic, comprehensive, accurate, and consistent forest resources data, will provide support for the complex integrated resource management decisions facing the people of British Columbia.

The forest inventory will provide an ecologically based resource inventory to a minimum standard and allow for enhanced inventories of higher standards where required. The inventory will be stand based and flexible, to meet changing client needs. It will allow for change reporting, monitoring, and independent accuracy assessments to ensure effective planning and management of the province's forests. This program will support and be consistent with the vision of the Forest Productivity Council of British Columbia:

"to be able to consistently and accurately predict the growth, yield and quality of British Columbia's forests under any resource management regime."

The Forest Resources Inventory will comply with the standards of the government-wide Land Information Infrastructure (LandData BC), which facilitates the sharing of land-related information with our clients.

Each Forest District will continuously house and manage its own seamless, integrated forest resources database, including field data capture, update, and quality control. Spatial and attribute data will be captured and managed in an integrated manner to ensure data integrity and to support the seamless view of forest resources data.

As new technologies are introduced to meet changing demands, the Forest Resources Inventory Branch will provide assistance for training, planning, monitoring, and applications development. This will be encouraged through effective communication among staff at all program levels (A Five Year Strategic Plan Commencing 1993/94).

METHODOLOGY

Introduction

The first phase of the provincial inventory program consisted mainly of management unit surveys, designed to provide average statistics for aggregated forest types. By 1978, the entire province was covered with this Level 2 inventory and, subsequently, emphasis was placed on obtaining more detailed information on portions of management units, called sub-units. A major requirement from this detailed inventory was that descriptive data (such as tree volumes) be reliable not only for aggregated types, but in terms of individual forest stands.

During the past 10 years, in addition to sub-unit inventories, the main emphasis has been placed on upgrading the Level 2 information on forest populations that were previously sampled inadequately, on digitizing forest cover maps, and on monitoring depletions with the use of satellite imagery.

In 1988, funds were allocated for the implementation of a provincial re-inventory program and for the completion of the digital conversion of the remaining forest cover maps.

This paper contains an overview of the re-inventory program, including brief descriptions of the operational Geographic Information System (GIS) and satellite image analysis update procedures.

Management Unit Inventories

The classification system used prior to 1978 stratified land into homogeneous strata on 1:15,840 aerial photographs. Areas within management units were first divided into two broad classes: non-forest and forest land. The non-forest land was further subdivided into areas with and without cover. Areas with cover included such types as lowland, alpine, swamp, and other non-productive forest and brush. Areas without cover included productive open range, cultivated and urban areas, and wild meadows, as well as non-productive barren lands and water. Forest land, on the other hand, was strati-

fied as mature, immature, not satisfactorily restocked, mature residual, and non-commercial forest land. The mature and immature forest types were further classified by species, age, height, stocking, and site. Species composition was by gross volume, using 20% limits for 20-year classes up to 140 years; the next two classes were 141–250 and 251+ years. Height was put into 9-metre (30-foot) classes. Stocking classes were relatively broad, grouping all immature stands into one class. Stands with 25–75% disturbance were classed mature residual, while stands without any major disturbance were divided into two groups on the basis of having more or less than 76 trees (27.5+ cm dbh) per hectare (this class further included some refinements for relationships of dominants and co-dominants, using four main classes). The not-satisfactorily-restocked description was applied to denuded areas that do not meet minimum stocking requirements of approximately 750 healthy, well-distributed seedlings or juvenile stems per hectare. Areas with 26–75% disturbance that still supported remnants of the original forest were classed as mature residual, whereas the non-commercial forest classification applied mainly to deciduous brush growing on productive sites. In addition to the above classification, some disturbances or activities (if any) were recorded for each stratum, such as those caused by fire, logging, insects, diseases, windfall, slide, ice, snow, and humans.

In 1973, the inventory program was expanded to include the identification of environmentally sensitive areas that should be protected from harvesting, as well as areas that need special consideration in terms of multiple resource use. Timber production constraints recognized by this program include soil and steepness problems, regeneration or plantation constraints, inoperability, avalanche and snow chute hazards, high recreational values, and essential habitat for wildlife and fish.

The sampling system used in the management unit inventories was a kind of stratified random sampling. Mature forest types were grouped into 42 inventory types, immature stands were grouped into 17 growth types, and two or four fixed-radius plots were collected in each type with the objective of providing an average volume for the particular management unit. Since sample compilations occurred at the end of the field season, adequate control could not be implemented on the optimization of the number of samples per sub-population. Consequently, some aggregated types contained as few as two samples, while the major types contained up to 100 random samples.

The initial design of the sampling system was efficient and delivered the required information for management decisions. However, as adjacent management units were completed, the sampling design was not adjusted to include applicable samples from other management units, especially those belonging to the same ecological region. As a result, in some populations up to 1,000 samples were collected, while other aggregated types were not sampled adequately. Another major weakness of the sampling system was that the classification parameters did not explain the high degree of variation in volume within the aggregated types. Therefore, the increased number of

samples had a beneficial effect only on the sampling error, but did not improve the capability of estimating the volume of individual stands. This was largely due to the effect of the broad class intervals on the parameters of the classification system, especially the stocking classes.

The sub-unit inventory system, started in 1977, introduced some major changes in classification, sampling, and data analysis. In particular, the class intervals were abolished and the classification parameters were measured in continuous units. Species composition (to the nearest 10%), age in years, and height in metres was recorded; the stocking classes were changed to stems per hectare or to crown closure to the nearest 10%. Also, the sample design was changed to a multi-phase sampling system in order to capitalize on large-scale photo samples at Phase 1, then still utilize all the available ground samples at Phase 2. This new approach allowed the use of regression estimators for volume calculations. Site index of each stand could be calculated from age and height, then volume was estimated through a regression equation with age, site index, and crown closure or stems per hectare as independent variables.

The 10-Year Re-inventory Program: 1988–1998

The objectives of the re-inventory program are to develop and maintain a quantitative description of the forest resources in the province, and to assess the land for its potential for growing trees continuously, producing livestock and wildlife, providing forest-oriented recreation, and accommodating other forest uses.

Components of the re-inventory program are described in detail in the Forest Inventory Manual and the highlights are summarized briefly as follows.

Classification Using 1:15,000 scale aerial photographs, the land is stratified into homogeneous strata with a minimum size of 5 hectares. Each stratum is then given a unique number within a 6' x 12' BCGS mapsheet, and the attribute list is filled out according to the specifications of the classification system.

Land is first divided into three broad classes: non-forest land, non-productive land, and productive forest land. Non-forest land is further subdivided as productive open range, cultivated and urban areas, wild meadows, non-productive barren lowland, alpine, swamp, and other non-productive forest and brush. Land is stratified as productive forest if it can provide the greatest contribution to the social and economic welfare of the province when it is maintained, under forest management, in successive crops of trees or forage, or both. Productive forest land is then described in terms of the following parameters.

1. **Species composition**: is identified to the nearest 10% of total volume when trees are equal to or greater than 7.5 cm dbh, or to the nearest 1%, if practical. When trees are less than 7.5 cm dbh species composition is recorded to the nearest 10% by number of stems.

2. **Age:** is estimated to the nearest year, based on the average total age of the leading species, using dominants defined as the 100 largest trees per hectare.
3. **Height:** is estimated to the nearest 0.1 metre when practical, otherwise to the nearest 1 metre, based on the leading species, using dominants defined as the 100 largest trees per hectare.
4. **Crown closure:** is estimated to the nearest 10% of the area occupied by the canopy, through vertical projections, of the trees equal to or greater than 7.5 cm dbh.
5. **Stand density:** is estimated or measured to the nearest stem per hectare of the trees equal to or greater than 7.5 cm dbh.
6. **History:** is described according to the specifications of the Silviculture Branch and includes disturbances, site preparation, stand tending, and regeneration.
7. **Environmental sensitivity:** is described to reflect the environmental, social, economic, and technological factors in force at the time of the inventory. In particular, the following factors are recognized:
   Soil sensitivity (Es): is given to strata on fragile or unstable soils, which are likely to be subject to severe deterioration if trees are removed by harvesting.
   Plantation or regeneration sensitivity (Ep): is designated when reforestation may be difficult and the delay could be 20 years or more, following disturbance such as harvesting or fire.
   Avalanche sensitivity: is recognized in cases where lack of disturbance prevents or constrains the occurrence of snow avalanche, hence protecting artificial features and natural resources.
   Recreation sensitivity (Er): is designed for strata with recreational values that are sensitive to environmental modification, particularly timber harvesting.
   Wildlife habitat sensitivity (Ew): is given to strata with wildlife habitat value that warrants management consideration and/or protection.
   Watershed sensitivity (Eh): is designated for strata where watersheds or drainage systems require special management considerations and/or protection, in order to maintain water quality and quantity.
   Fisheries sensitivity (Ef): is recognized for strata where stream systems must be managed or protected for fish populations.
8. **Inoperable problem areas:** are strata containing merchantable or potentially merchantable timber, but because of some physical barrier or other limitations, are considered inoperable in terms of current harvesting techniques.

Sampling The main objective of sampling is to obtain an estimate of the parameters specified under classification, or of the variables that may be derived from them. In the case of forest land, the main derived variable is volume, which needs to be estimated at an allowable sampling error of plus or minus 10% at a 95% confidence interval.

The sampling system selected for the re-inventory is a multi-phase stratified random sampling, using large-scale aerial photo plots and ground samples within the context of double sampling. Since most of the province has been sampled previously, the sampling system was designed to take advantage of the existing inventory data and ground samples. Area summaries by major strata, and scattergrams of existing ground samples, can provide valuable information for the planning and implementation of re-inventories. In particular, such data may be used to identify the strata that have not been sampled previously, such as second growth and deciduous stands. In addition, existing samples provide reliable estimates of sample variances and, hence, can be used to calculate the number of sample variances that may be required within each major stratum. Components of the sampling system are summarized as follows:

Phase 1 samples: are large-scale, 1:200 – 1:2,000 aerial photo plots distributed randomly or in a restricted random manner. Random distribution of photo samples may be achieved by selecting candidate strata, with the aid of random numbers, within the entire management unit, sub-unit, or map sheet. The number of candidate strata to be selected depends on the intensity of sampling and the existing variation within major strata. Experience indicated that in an average management unit of 150 map sheets (each map sheet being 12° longitude and 6° latitude at 1:20,000 scale, covering approximately 14,000 hectares), four to six strata should be selected randomly per map sheet to provide the required accuracy and precision; in an average sub-unit (consisting of about 20 map sheets at 1:20,000), on the other hand, up to 30 photo samples may be required per map sheet to estimate the volume of each major stratum at ± 10% sampling error at the 95% confidence level. In addition, strata containing previous samples are automatically chosen for Phase 1 sampling.

In each stratum selected at Phase 1, a strip is located randomly, along which continuous stereo photos are obtained, using twin Hasselblad 70 mm cameras mounted at a fixed distance apart on an aerial camera platform attached to a helicopter. In most cases, the photo interpreter is in the helicopter when the photos are taken and records air calls to aid in species identification and in the estimation of age and height. Six fixed-radius plots are then randomly selected along each strip to constitute the Phase 1 photo samples. Data obtained on the photo plots include species identification, stem count, height, crown diameter, crown length, estimation of quality, and assessment of crown closure. With the aid of these variables, volumes are estimated for each of the six plots and averaged for the sample. As the inventory proceeds, photo plots are subjected to statistical analyses in order to ensure that all major strata are sampled, but without oversampling. As soon as the required accuracy is obtained in a stratum, the remaining stereo photos are then used only for photo-interpretation or classification purposes.

Phase 2 samples: are ground samples selected in a restricted random manner from the photo samples with the purpose of covering the range of variation encountered in photo samples. The ratio of photo samples to ground

samples is governed by the strength of the relationship between the two samples and the corresponding costs. Experience indicates that this ratio is 4:1, although it may be as great as 10:1. However, if preliminary tests indicate that the relationship between Phase 1 and Phase 2 samples is weak, then Phase 1 samples may be discontinued or used only for classification purposes.

Measurements on ground samples include dbh, age, height, and pathological and quality indicators for each tree, as well as species identification and measurement of crown closure. While ground samples consist mainly of six points located along a line across the stratum, where the in-trees are selected with the aid of a relascope, fixed-radius plots are recommended for types wherein a large portion of the trees are below the minimum diameter. In the case of point samples, the band is selected with the objective of obtaining 30 to 70 trees per six-point sample. Similarly for fixed-radius plots, the objective is to obtain about 100 trees on six plots, hence plot size is selected accordingly.

Sample compilation and application: Volumes at Phase 1 and 2 are compiled at close utilization, then compared in terms of double sampling, using regression equations. For this comparison, all previously collected ground samples are used and the values of photo samples are "corrected" with the appropriate regression equation. Next, volume equations are developed with the pooled sample database, using age, site index, and crown closure or stems per hectare as independent variables. These regressions are developed for each species, based on pure stands, then applied to the mixed species samples by prorating the species composition. The purpose of this exercise is to evaluate the synergistic or antagonistic relationships that may exist between the various species growing in mixtures. Next, the single-species volume equations are applied to each polygon and prorated in terms of species compositions. For example, if species A contributes 70% to the stand, the pure species volume equation for species A is multiplied by 0.7 in order to adjust for the species composition.

Hence, the sample database is linked to the individual stands or polygons through a refined classification system, rather than through average volumes by aggregated types. For this reason, volumes can be calculated on stand-specific bases.

Digital Conversion Based on the data obtained from interpreted aerial photographs and samples, individual polygons are described in terms of the classification system. These descriptions are entered into an attribute file and referenced through the unique numbers. The classification system is applied consistently in a horizontal (strata) and vertical (layers) plane, hence a separate description is given for each layer of multi-story stands.

If the re-inventory is implemented in an area where the forest cover maps have been previously digitized, then the boundaries of polygons can be entered directly from photographs onto the digital file. Otherwise, all relevant layers of information must be converted into digital form. Procedures for digitization are documented in the Forest Inventory Manual.

The geo-referenced forest land information consists of up to 19 levels of overlays, including forest cover, cadastre, information on other resources, and various levels of administrative boundaries. These levels are overlaid with the aid of a geographic information system and the areas of resultant polygons are linked to the volume files.

Inventory Update Program

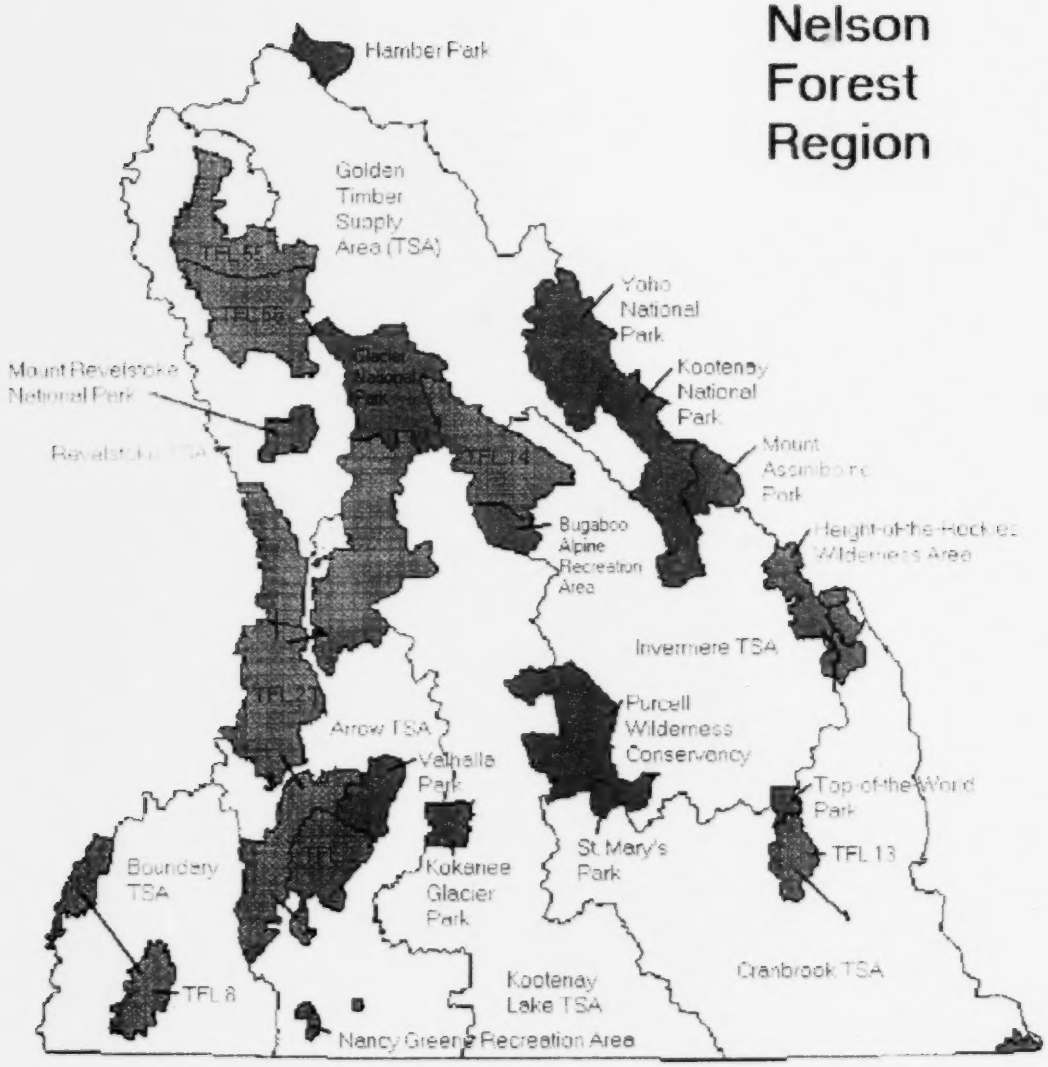
In addition to the 10-year inventory program, all maps are updated on a 2-year cycle, using satellite imagery. Hence, 3,300 maps need to updated annually. These updates include changes since the last inventory, such as harvesting, fire, and damage by insects and disease. During these updates, any available information on stand treatments and history are also entered into the database.

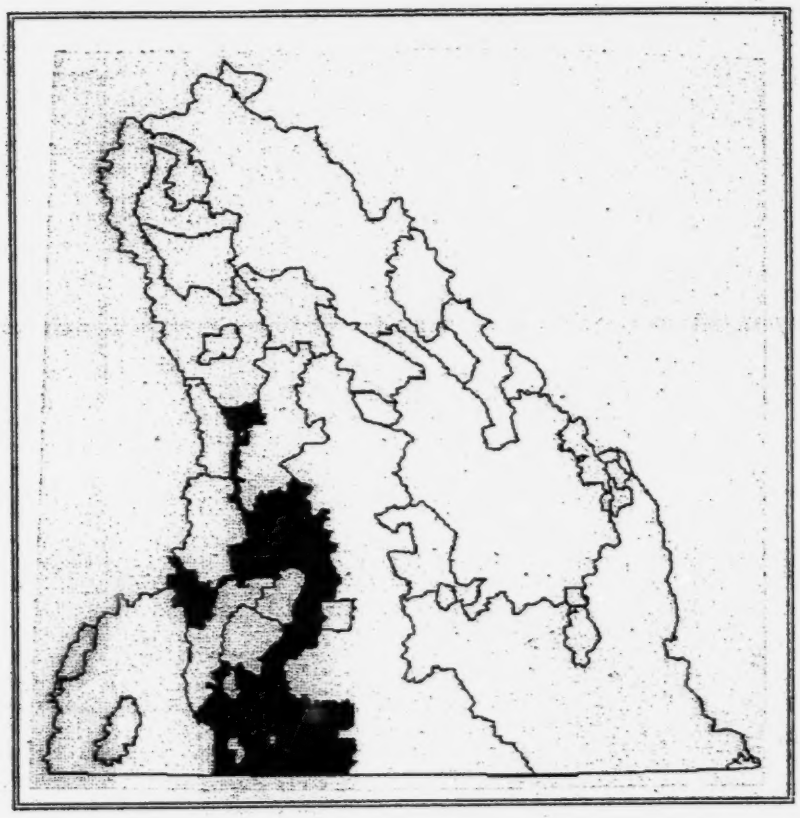
Areas reported, areas not reported, and total area (hectares): Nelson Region

	Reported from Database	Other Data	Not Reported	Total Area
Timber Supply Areas				
Arrow Timber Supply Area	751,784		2,317	754,100
Boundary Timber Supply Area	580,110			580,110
Cranbrook Timber Supply Area	1,277,919		112,880	1,390,800
Golden Timber Supply Area	920,415			920,415
Invermere Timber Supply Area	1,019,092		299	1,019,391
Kootenay Lake Timber Supply Area	1,144,300		508	1,144,808
Revelstoke Timber Supply Area	493,805		10,747	504,552
Tree Farm Licences				
Tree Farm Licence 3, Little Slocan		79,372		79,372
Tree Farm Licence 8, Boundary		77,610		77,610
Tree Farm Licence 13, Bull River		37,197		37,197
Tree Farm Licence 14, Spillimacheen		129,689		129,689
Tree Farm Licence 23, Arrow Lakes		582,060		582,060
Tree Farm Licence 30, Northwood-Prince George			898	898
Tree Farm Licence 55 and 56			193,322	193,322
Managed Forest Unit 38			11,576	11,576
Protected Areas Reported On				
Blanket Creek Provincial Park	215			215
Bugaboo Alpine Recreation Area	13,674		8,084	21,721
Bugaboo Glacier Provincial Park	383			383
Champion Lakes Provincial Park	1,427			1,427
Conkle Lake Lake Provincial Park	700			700
Ecological Reserve 031, Lew Creek	987			987
Ecological Reserve 034, Big White Mountain	190			190
Ecological Reserve 056, Goosegrass Creek	2,729			2,729
Elk Lakes Provincial Park		6,045		6,045
Fry Creek Canyon Recreation Area	656			656
Kikomun Creek Provincial Park	692			692
Kokanee Glacier Provincial Park	17,931		6,536	24,467
Kokanee Glacier Recreation Area	6,456			6,456
Nancy Green Recreation Area	7,876			7,876
Premier Lake Provincial Park	210			210
Purcell Wilderness Conservancy		135,994		135,994
Stagleap Provincial Park	1,247			1,247
St. Mary's Alpine Provincial Park		9,505		9,505
Top of the World Provincial Park		8,663		8,663
Valhalla Provincial Park	49,503			49,503
Whiteswan Lake Provincial Park	2,101			2,101

	Reported from Database	Other Data	Not Reported	Total Area
Protected Areas Not Reported On: Lack of Detailed Digital Data				
Akamina-Kishinena Recreation Area			10,658	10,658
Elk Lakes Recreation Area			12,133	12,133
Hamber Provincial Park			24,125	24,125
Mount Assiniboine Provincial Park			39,014	39,014
Glacier National Park			135,137	135,137
Kootenay National Park			138,757	138,757
Mount Revelstoke National Park			26,329	26,329
Yoho National Park			129,128	129,128
Nelson Region Totals	6,294,401	1,066,134	862,411	8,222,946

Nelson
Forest
Region
TFL 55
TFL 56
Glacier
National
Park
TFL 14
TFL 23
TFL 3


Nelson
Forest
Region
Hamber Park
Golden
Timber
Supply
Area (TSA)
TFL 5
TFL 56
Yoho
National
Park
Kootenay
National
Park
Mount Revelstoke
National Park
Glacier
National
Park
TFL 4
Mount
Assiniboine
Park
Bugaboo
Alpine
Recreation
Area
Height-of-the-Rockies
Wilderness Area
Invermere TSA
TFL 2
Arrow TSA
Purcell
Wilderness
Conservancy
Valhalla
Park
Top-of-the-World
Park
TFL 13
St. Mary's
Park
Boundary
TSA
Kokanee
Glacier
Park
TFL 8
Kootenay
Lake TSA
Cranbrook TSA
Nancy Greene Recreation Area



Section A

Arrow Timber Supply Area

In the Nelson Forest Region (TSA 1)

	Page
Physical Land Base and Administration	1
Reports by Inventory Type Group and Height Class	
Arrow Timber Supply Area	3
King George VI Provincial Park	46
McDonald Creek Provincial Park	49
Nancy Greene Provincial Park	53
Syringa Creek Provincial Park	57

Arrow Timber Supply Area

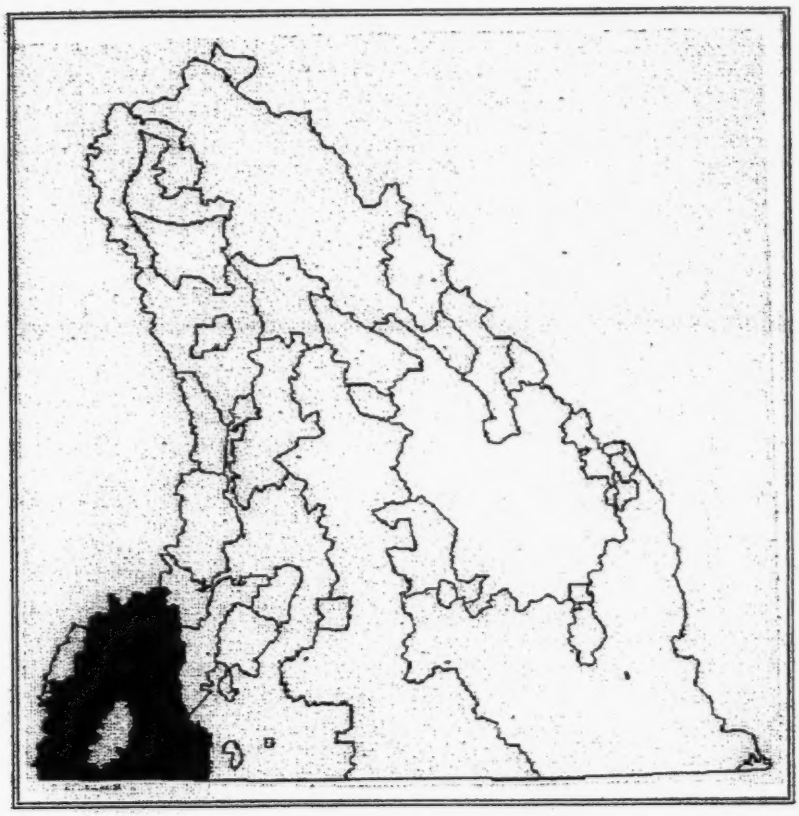
In the Nelson Forest Region (TSA 1)
Physical Land Base and Administration
Area (ha)

Physical Land Base		Area Totals
Productive Forest		489,077
Alpine	60,175	
Rock	17,094	
Alpine forest	38,316	
Non-productive brush	21,627	
Non-productive	32,265	
Non-productive burn	8,117	
Lake	53,866	
Gravel bar	200	
River	4,799	
Swamp or muskeg	870	
Clearing	13,190	
Urban	11,821	
Meadow	165	
Open range	202	262,706
No typing available		2,317
Total for the Arrow Timber Supply Area		754,100

Arrow Timber Supply Area

In the Nelson Forest Region (TSA 1)
Physical Land Base and Administration
Area (ha)

Administration of Land Base			Area Totals
Land under Private Administration			
Crown Granted			116,443
Land under Provincial Administration			
Area in a Timber Supply Area (62C)			
In a Provincial Forest	465,027		
Not in a Provincial Forest	63,623	528,650	
Miscellaneous reserves (69N)			
In a Provincial Forest	101,921		
Not in a Provincial Forest	175	102,095	
Woodlots			
Private land	192		
Provincial Crown land	2,148	2,340	
UREP Reserves: Use, Recreation, and Enjoyment of the Public		2,230	
Active Timber Licence in a Timber Supply Area		1,274	
Regional Parks			
582 Appledale Regional Park		4	
672 Pass Creek Regional Park		18	
class A Provincial Parks			
1057 McDonald Creek Provincial Park		270	
708 Syringa Creek Provincial Park		223	
707 Nancy Greene Provincial Park		208	
575 King George VI Provincial Park		167	
705 Beaver Creek Provincial Park		56	
709 Arrow Lakes Provincial Park (Sites B;Burton,C;Fauquier)		40	
614 Rosebery Provincial Park		22	
706 Erie Creek Provincial Park		11	
718 Inonoaklin Provincial Park		6	
class C provincial park with a park board			
1113 Summit Lake Provincial Park		7	637,821
Land under Federal Administration			
Federal Reserves			36
Total for the Arrow Timber Supply Area			754,100



Section B

Boundary Timber Supply Area

In the Nelson Forest Region (TSA 2)

	Page
Physical Land Base and Administration	1
Reports by Inventory Type Group and Height Class	
Boundary Timber Supply Area	3
Kettle River Recreation Area	45

Boundary Timber Supply Area

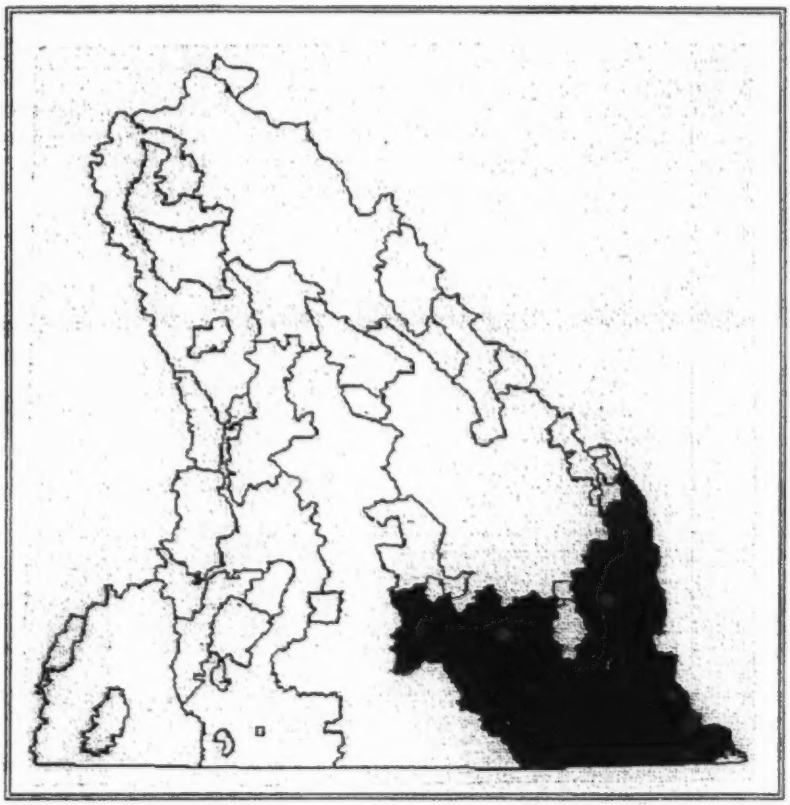
In the Nelson Forest Region (TSA 2)
Physical Land Base and Administration
Area (ha)

Physical Land Base		Area Totals
Productive Forest		461,865
Non-productive	41,148	
Open range	18,233	
Clearing	16,240	
Alpine forest	10,575	
Alpine	9,625	
Rock	7,924	
Urban	4,769	
Lake	3,288	
River	2,077	
Swamp or muskeg	1,795	
Non-productive burn	1,622	
Non-productive brush	841	
Meadow	88	
Gravel bar	23	118,245
Total for the Boundary Timber Supply Area		580,110

Boundary Timber Supply Area

In the Nelson Forest Region (TSA 2)
Physical Land Base and Administration
Area (ha)

Administration of Land Base			Area Totals
Land under Private Administration			
Crown Granted			61,906
Land under Provincial Administration			
Area in a Timber Supply Area (62C)			
In a Provincial Forest	290,154		
Not in a Provincial Forest	7,069	297,223	
Miscellaneous reserves (69N)			
In a Provincial Forest	211,055		
Not in a Provincial Forest	1,564	212,619	
Woodlots			
Private land	2,128		
Provincial Crown land	4,256	6,384	
Miscellaneous Areas			
UREP Reserves: Use, Recreation, and Enjoyment of the Public		1,511	
Miscellaneous leases (rod & gun etc) not defined		24	
class A provincial park (park not named)		113	
771 Kettle River Rec. Area		189	
1227 Texas Creek Provincial Park		79	518,141
Land under Federal Administration			
Federal Reserves			64
Total for the Boundary Timber Supply Area			580,110



Section C

Cranbrook Timber Supply Area

In the Nelson Forest Region (TSA 5)

	Page
Physical Land Base and Administration	1
Reports by Inventory Type Group and Height Class	
Cranbrook Timber Supply Area	4
Fort Steele Heritage Town	49
Height of the Rockies Wilderness Area	52
Mount Fernie Provincial Park	60
Norbury Lake Provincial Park	67
Wasa Lake Provincial Park	71
Wycliffe Regional Park	74

Cranbrook Timber Supply Area

In the Nelson Forest Region (TSA 5)
Physical Land Base and Administration
Area (ha)

Physical Land Base		Area Totals
Productive Forest		842,007
Alpine	195,044	
Alpine forest	70,304	
Non-productive	39,200	
Open range	28,694	
Non-productive burn	19,869	
Urban	17,500	
Clearing	15,411	
Rock	15,164	
Non-productive brush	13,029	
Lake	10,324	
River	5,833	
Swamp or muskeg	3,940	
Meadow	1,238	
Clay bank	312	
Gravel bar	53	435,913
No typing available		112,880
Total for the Cranbrook Timber Supply Area		1,390,800

Cranbrook Timber Supply Area

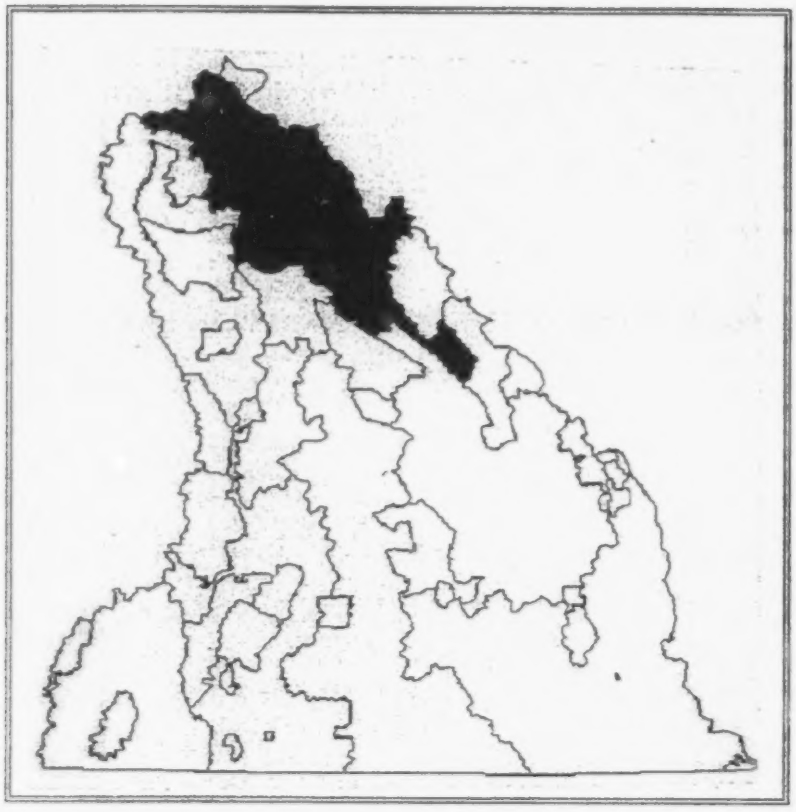
In the Nelson Forest Region (TSA 5)
Physical Land Base and Administration
Area (ha)

Administration of Land Base			Area Totals
Land under Private Administration			
Crown Granted		76,999	
Managed Forest Unit 27		112,254	
Managed Forest Unit 36		4,486	193,739
Land under Provincial Administration			
Area in a Timber Supply Area (62C)			
In a Provincial Forest	1,026,341		
Not in a Provincial Forest	37,151	1,063,492	
Miscellaneous reserves (69N)			
In a Provincial Forest	72,978		
Not in a Provincial Forest	1,813	74,791	
Woodlots			
Private land	259		
Provincial Crown land	1,919	2,178	
Christmas tree permits		5,865	
UREP Reserves: Use, Recreation, and Enjoyment of the Public		2,001	
Park equivalent or reserve including Recreation Areas, Regional Parks, Heritage Sites and Wildlife Management Reserves		273	
Protected Areas (Schedule A)		16,067	1,164,667
Land under Federal Administration			
Aboriginal reserves		12,191	
Dominion Government block		20,203	32,394
Total for the Cranbrook Timber Supply Area			1,390,800

Cranbrook Timber Supply Area

In the Nelson Forest Region (TSA 5)
Physical Land Base and Administration
Area (ha)

Protected Areas		Area Totals
Wilderness Areas within Provincial Forests		
	Height of the Rockies	14,943
class A Provincial Parks		
699	Mount Fernie Provincial Park	254
1261	Fort Steele Heritage Town	158
560	Wasa Lake Provincial Park	136
601	Norbury Lake Provincial Park	100
Regional Park		
1199	Wycliffe Regional Park	171
Protected areas under 100 ha		
612	Moyie Lake Provincial Park	83
638	Elk Valley Provincial Park	79
904	Ecol. Res. 104 Glinockie Creek	56
637	Crowsnest Provincial Park	45
606	Elko Provincial Park	28
528	Jimsmith Lake Provincial Park	12
671	Morrissey Provincial Park	5
		16,067



Section D

Golden Timber Supply Area

In the Nelson Forest Region (TSA 7)

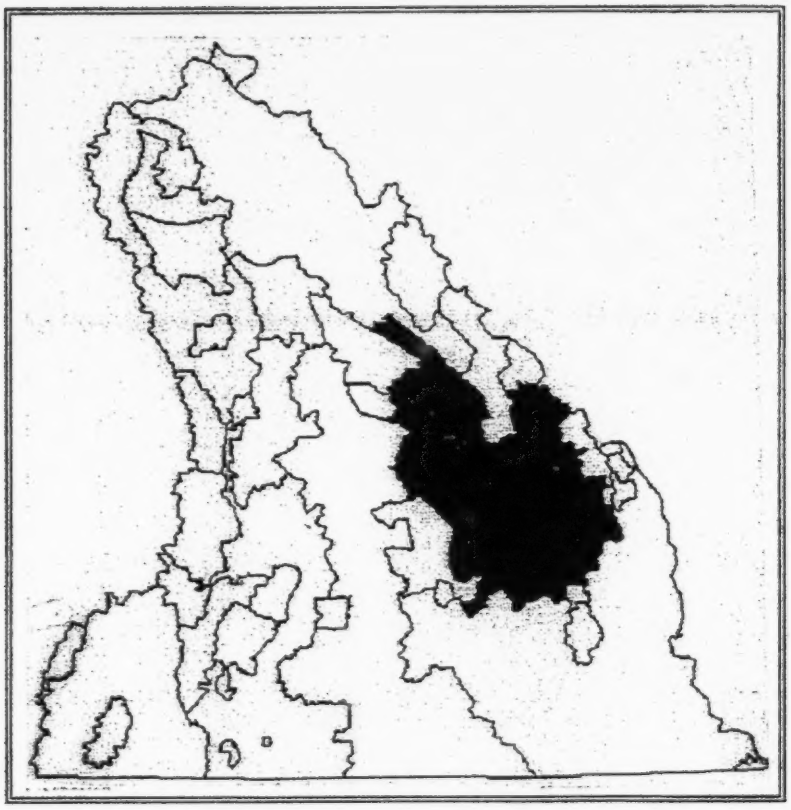
	Page
Physical Land Base and Administration	1
Reports by Inventory Type Group and Height Class	
Golden Timber Supply Area	3
Burgess And James Gadsden Provincial Park	46
Marl Creek Provincial Park	49

Golden Timber Supply Area

In the Nelson Forest Region (TSA 7)
Physical Land Base and Administration
Area (ha)

Physical Land Base		Area Totals
Productive Forest		318,878
Alpine	467,762	
Alpine forest	54,859	
Lake	26,956	
Non-productive	10,547	
River	9,957	
Non-productive burn	8,784	
Non-productive brush	8,320	
Rock	4,721	
Swamp or muskeg	4,631	
Clearing	3,647	
Urban	1,073	
Meadow	182	
Gravel bar	94	
Clay bank	6	601,537
Total for the Golden Timber Supply Area		920,415

Administration of Land Base			Area Totals
Land under Private Administration			
Crown Granted			14,079
Land under Provincial Administration			
Area in a Timber Supply Area (62C)			
In a Provincial Forest	704,723		
Not in a Provincial Forest	157,812	862,535	
Miscellaneous reserves (69N)			
In a Provincial Forest	31,655		
Not in a Provincial Forest	495	32,150	
Woodlots			
Private land	142		
Provincial Crown land	709	851	
Miscellaneous Areas			
UREP Reserves: Use, Recreation, and Enjoyment of the Public		2,785	
Miscellaneous leases (rod & gun etc) not defined		115	
class A provincial park (park not named)		111	
Active Timber Licence in a Timber Supply Area		7,339	
649 Marl Creek Provincial Park		196	
702 Burgess And James Gadsden Provincial Park		255	906,335
Total for the Golden Timber Supply Area			920,415



Section E

Invermere Timber Supply Area

In the Nelson Forest Region (TSA 9)

	Page
Physical Land Base and Administration	1
Reports by Inventory Type Group and Height Class	
Invermere Timber Supply Area	3
Columbia Lake Provincial Park	39
Height-of-the-Rockies Wilderness Area	44
Premier Lake Provincial Park	59
Ram Creek Ecological Reserve	66

Invermere Timber Supply Area

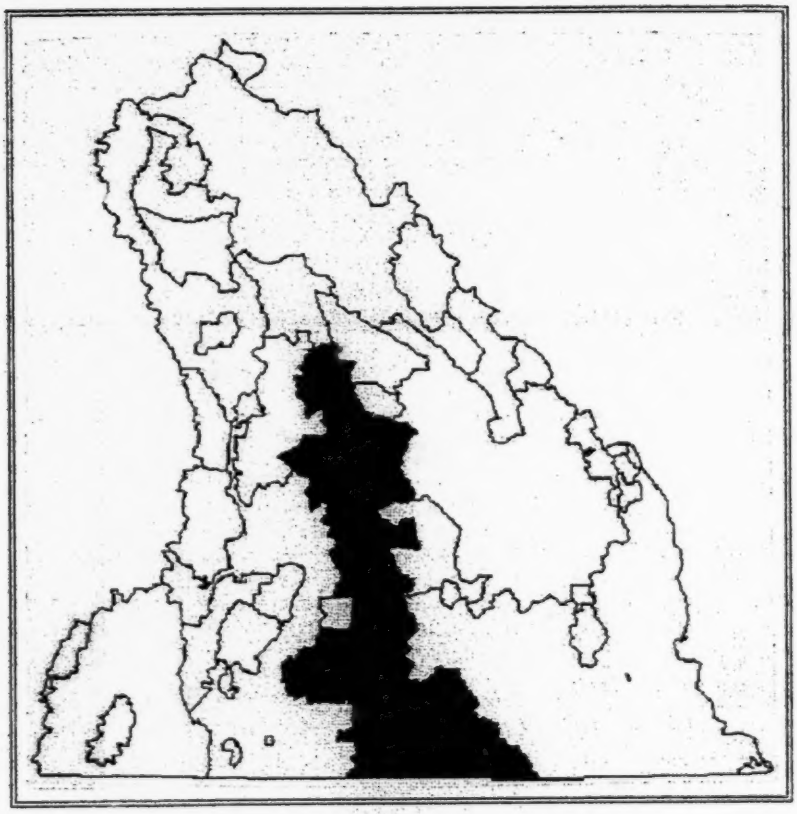
In the Nelson Forest Region (TSA 9)
Physical Land Base and Administration
Area (ha)

Physical Land Base		Area Totals
Productive Forest		578,426
Alpine	258,110	
Alpine forest	82,058	
Non-productive	22,274	
Swamp or muskeg	14,350	
Open range	10,825	
Clearing	10,122	
Rock	8,986	
Non-productive burn	8,840	
Non-productive brush	8,185	
Lake	6,889	
River	5,889	
Urban	2,985	
Clay bank	1,161	
Meadow	279	
Gravel bar	11	440,965
		1,019,391

Invermere Timber Supply Area

In the Nelson Forest Region (TSA 9)
Physical Land Base and Administration
Area (ha)

Administration of Land Base			Area Totals
Land under Private Administration			
Crown Granted			69,152
Land under Provincial Administration			
Area in a Timber Supply Area (62C)			
In a Provincial Forest	575,250		
Not in a Provincial Forest	17,721	592,971	
Miscellaneous reserves (59N)			
In a Provincial Forest	262,104		
Not in a Provincial Forest	4,785	266,890	
Woodlots			
Private land	364		
Provincial Crown land	2,665	3,029	
Miscellaneous Areas			
Christmas tree permits		15,434	
UREP Reserves: Use, Recreation, and Enjoyment of the Public		14,441	
Miscellaneous leases (rod & gun etc) not defined		852	
class A provincial park (park not named)		83	
Ecological reserves		50	
Height of the Rockies Wilderness Area within the provincial forest		50,848	
National Parks		3,516	
584 Premier Lake Prov. Park		608	
826 Ecol. Res. 026 Ram Creek		125	
1221 Columbia Lake Provincial Park		268	949,115
Land under Federal Administration			
Aboriginal reserves			1,124
Total for the Invermere TSA			1,019,392



Section F

Kootenay Lake Timber Supply Area

In the Nelson Forest Region (TSA 13)

	Page
Physical Land Base and Administration	1
Reports by Inventory Type Group and Height Class	
Kootenay Lake Timber Supply Area	4
Kokanee Creek Provincial Park	55
Kooteney Lake Provincial Park	60
Pilot Bay Provincial Park	68
Trout Lake Provincial Park	71

Kootenay Lake Timber Supply Area

In the Nelson Forest Region (TSA 13)
Physical Land Base and Administration
Area (ha)

Physical Land Base		Area Totals
Productive Forest		681,752
Alpine	238,527	
Alpine forest	66,298	
Lake	53,865	
Non-productive	30,201	
Non-productive brush	23,264	
Clearing	21,799	
Rock	8,805	
Urban	7,110	
Non-productive burn	4,512	
Swamp or muskeg	4,101	
River	3,975	
Gravel bar	268	
Meadow	219	
Open range	107	
Clay bank	8	463,057
Totals for the Kootenay Lake Timber Supply Area		1,144,808

Kootenay Lake Timber Supply Area

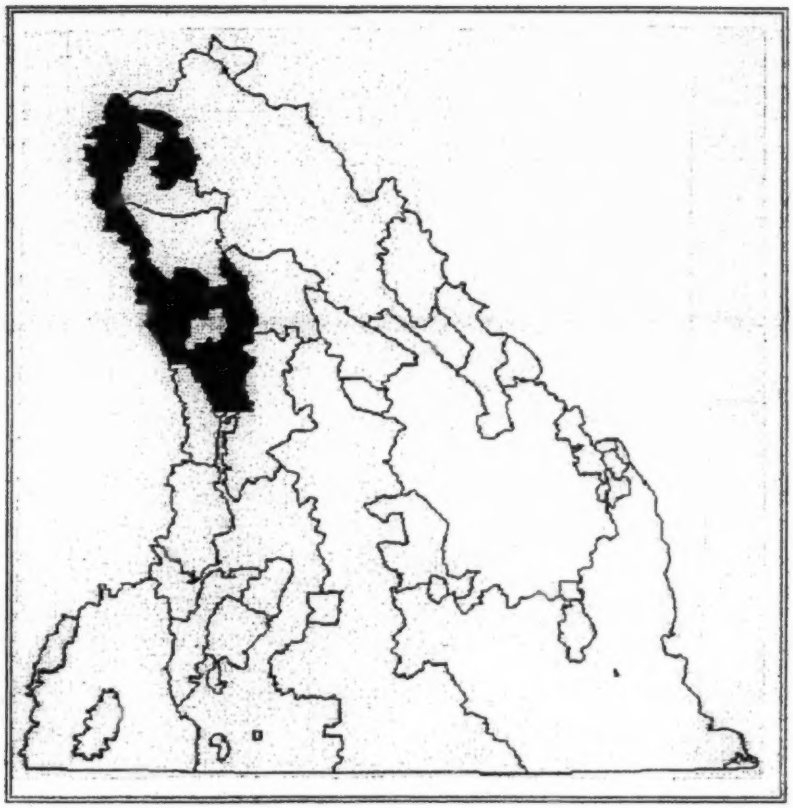
In the Nelson Forest Region (TSA 13)
Physical Land Base and Administration
Area (ha)

Administration of Land Base			Area Totals
Land under Private Administration			
Crown Granted		64,548	
356 Managed Forest Unit 40		56,062	
448 Managed Forest Unit 54		7,846	128,456
Land under Provincial Administration			
Area in a Timber Supply Area (62C)			
In a Provincial Forest	887,188		
Not in a Provincial Forest	48,394	935,582	
Miscellaneous reserves (69N)			
In a Provincial Forest	61,594		
Not in a Provincial Forest	2,305	63,899	
Woodlots			
Private land	1,202		
Provincial Crown land	3,510	4,712	
UREP Reserves: Use, Recreation, and Enjoyment of the Public		1,902	
Park equivalent or reserve including Recreation Areas, Regional Parks, Heritage Sites and Wildlife Management Reserve		6,320	
Miscellaneous leases (rod & gun etc) not defined		99	
Active Timber Licence in a Timber Supply Area		94	
Protected areas - see next page		1,298	1,013,905
Land under Federal Administration			
Aboriginal reserves			2,448
Totals for the Kootenay Lake Timber Supply Area			1,144,809

Kootenay Lake Timber Supply Area

In the Nelson Forest Region (TSA 13)
Physical Land Base and Administration
Area (ha)

Protected Areas		Area Totals
1223	Kootenay Lake Provincial Park (Multi Site)	360
1228	Trout Lake Provincial Park	307
1081	Pilot Bay Provincial Park	301
534	Kokanee Creek Provincial Park	159
1009	Cody Caves Provincial Park	64
617	Ryan Provincial Park	61
599	Lardeau Provincial Park	14
1035	Grohman Narrows Provincial Park	13
1015	Drewry Point Provincial Park	13
562	Yahk Provincial Park	8
		1,298



Section G

Revelstoke Timber Supply Area

In the Nelson Forest Region (TSA 27)

	Page
Physical Land Base and Administration	1
Reports by Inventory Type Group and Height Class	
Revelstoke Timber Supply Area	3

Revelstoke Timber Supply Area

In the Nelson Forest Region (TSA 27)
Physical Land Base and Administration
Area (ha)

Physical Land Base		Area Totals
Productive Forest		210,131
Alpine	192,670	
Non-productive brush	29,305	
Alpine forest	28,247	
Lake	15,492	
Rock	6,105	
Non-productive	5,042	
Clearing	2,691	
Urban	1,719	
River	1,545	
Swamp or muskeg	763	
Non-productive burn	50	
Gravel bar	23	
Meadow	20	
Clay bank	2	283,673
No typing		10,747
Totals for the Revelstoke Timber Supply Area		504,552

Revelstoke Timber Supply Area

In the Nelson Forest Region (TSA 27)
Physical Land Base and Administration
Area (ha)

Administration of Land Base			Area Totals
Land under Private Administration			
Crown Granted			5,670
Land under Provincial Administration			
Area in a Timber Supply Area (62C)			
In a Provincial Forest	212,315		
Not in a Provincial Forest	276,419	488,734	
Miscellaneous reserves (59N)			
In a Provincial Forest	4,801		
Not in a Provincial Forest	319	5,120	
Woodlots			
Provincial Crown land	780	780	
Miscellaneous Areas			
UREP Reserves: Use, Recreation, and Enjoyment of the Public		374	
Active Timber Licence in a Timber Supply Area		3,741	
National parks		133	498,882
Totals for the Revelstoke Timber Supply Area			504,552

Section H

Tree Farm Licenses

In the Nelson Forest Region

Reports by Inventory Type Group and Height Class

Arrow Lakes (TFL 23)	2
Boundary (TFL 8)	38
Bull River (TFL 13)	60
Little Slocan (TFL 3)	85
Spillimacheen (TFL 14)	115

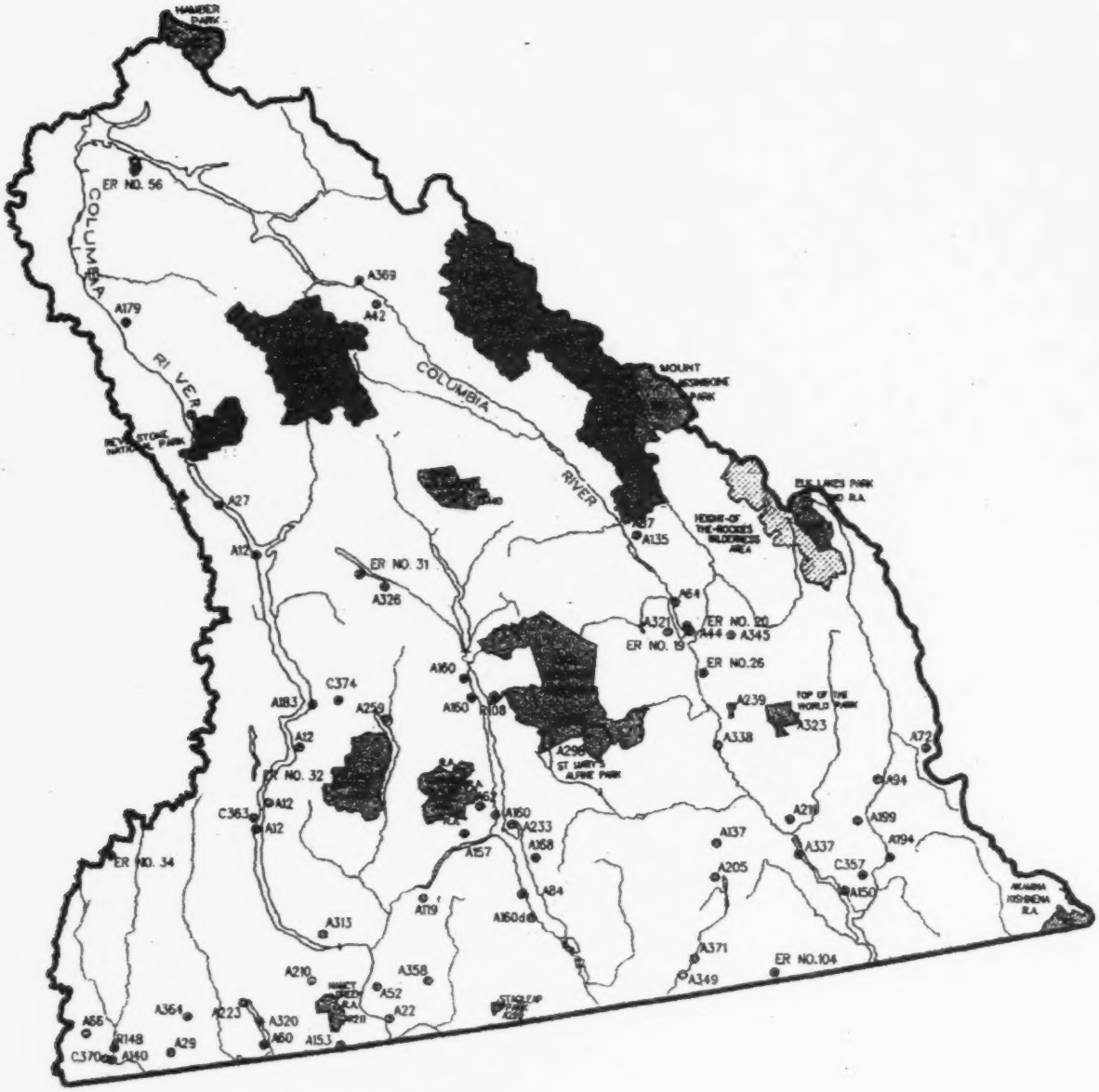
Section I

Protected Areas

In the Nelson Forest Region

NELSON FOREST REGION

NELSON FOREST REGION



Protected Areas Outside of TSA's

In the Nelson Forest Region

Reports by inventory type group and height class area	Page
Big White Mountain Ecological Reserve (Nelson Forest Region)	2
Big White Mountain Ecological Reserve (Kamloops Forest Region)	6
Blanket Creek Provincial Park	10
Bugaboo Alpine Recreation Area	13
Bugaboo Glacier Provincial Park	19
Champion Lakes Provincial Park	22
Conkle Lakes Provincial Park	28
Elk Lakes Provincial Park	34
Fry Creek Canyon Recreation Area	38
Goosegrass Creek Ecological Reserve	45
Kikomun Creek Provincial Park	50
Kokanee Glacier Provincial Park	53
Kokanee Glacier Recreation Area	71
Lew Creek Ecological Reserve	83
Nancy Greene Recreation Area	88
Purcell Wilderness Conservancy	104
St. Mary's Alpine Provincial Park	131
Stagleap Provincial Park	139
Top of the World Provincial Park	144
Valhalla Provincial Park	153
Whiteswan Lake Provincial Park	178

SECTION J **PROTECTED AREAS MAP INDEX**

PARK NAME	TYPE	PARK #
ADAMS LAKE	RA	1
AKAMINA-KISHINENA	RA	2
ALEXANDER BRIDGE	PP	3
ALICE LAKE	PP	4
ALLISON LAKE	PP	5
ANDREWS BAY	PP	6
ANDY BAILEY	RA	7
APEX MOUNTAIN	RA	9
APODACA	PP	10
ARBUTUS GROVE	PP	11
ARROW LAKES (SITES)	PP	12
ATLIN	PP	13
BABINE MOUNTAINS	RA	14
BALLINGALL ISLETS NATURE	PP	15
BAMBERTON	PP	16
BARKERVILLE	PP	17
BEAR CREEK	PP	18
BEATTON	PP	19
BEAUMONT	PP	20
BEAUMONT MARINE	PP	21
BEAVER CREEK	PP	22
BELLHOUSE	PP	23
BIG BAR LAKE	PP	24
BIJOUX FALLS	PP	25
BIRKENHEAD LAKE	PP	26
BLANKET CREEK	PP	27
BOTANICAL BEACH	PP	28
BOUNDARY CREEK	PP	29
BOWRON LAKE	PP	30
BOYA LAKE	PP	31
BOYLE POINT	PP	32
BRANDYWINE FALLS	PP	33
BRIDAL VEIL FALLS	PP	34
BRIDGE LAKE	PP	35
BROMLEY ROCK	PP	36
BROUGHTON ARCHIPELAGO MARINE	PP	36A
BROOKS PENINSULA	RA	37
BUCCANEER BAY MARINE	PP	38
BUCKINGHORSE RIVER WAYSIDE	PP	39
BUGABOO GLACIER	PP	40
BUGABOO ALPINE	RA	40A
BULL CANYON	PP	41
BURGESS AND JAMES GADSDEN	PP	42
CABBAGE ISLANDMARINE	PP	43
CANAL FLATS	PP	44
CANIM BEACH	PP	45
CAPE SCOTT	PP	46
CARIBOO NATURE	PP	47
CARMANAH PACIFIC	PP	48
CARP LAKE	PP	49
CASCADE	RA	50
CATHEDRAL	PP	51
CHAMPION LAKES	PP	52
CHARLIE LAKE	PP	53
CHASM	PP	54
CHEMAINUS RIVER	PP	55
CHILLIWACK LAKE	PP	56
CHILLIWACK RIVER	PP	57
CHINA BEACH	PP	58
CHRISTIE MEMEORIAL	PP	59
CHRISTINA LAKE	PP	60
CODVILLE LAGOON MARINE	PP	60A
CINNEMOUSUN NARROWS	PP	61
CODY CAVES	PP	62
COLDWATER RIVER	PP	63
COLUMBIA LAKE	PP	64
COLUMBIA VIEW	PP	65
CONKLE LAKE	PP	66
SOPELAND ISLANDS MARINE	PP	67
COQUIHALLA CANYON	RA	68
COQUIHALLA RIVER	RA	69
CORMORANT CHANNEL PARK	PP	69A
COQUIHALLA SUMMIT	RA	70
CROOKED RIVER	PP	71
CROWSNEST	PP	72
CULTUS LAKE	PP	73
CYPRESS	PP	74
DAHL LAKE	PP	75
D'ARCY ISLAND MARINE	PP	76
DARKE LAKE	PP	77
DAVIS LAKE	PP	78
DESOLATION SOUND MARINE	PP	79
DIANA LAKE	PP	80
DISCOVERY ISLAND MARINE	PP	81
DIONISIO POINT	PP	81A
DOWNING	PP	83
DREWRY POINT	PP	84
DRIFTWOOD CANYON	PP	85
DRUMBEG	PP	86
DRY GULCH	PP	87
DUNLEVY	RA	88
EAST PINE	PP	89
ECHO BAY MARINE	PP	90
ECHO LAKE	PP	91
ELK FALLS	PP	92
ELK LAKES	PP	93
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ELK VALLEY	PP	94
ELLISON	PP	95
EMORY CREEK	PP	96
ENEAS LAKES	PP	97
ENGLISHMAN RIVER FALLS	PP	98
ESKERS	PP	99
ETHEL F. WILSON MEMORIAL	PP	100
EXCHAMSIKS RIVER	PP	101
F.H.BARBER	RA	102
FILLONGLEY	PP	103
FIORDLAND	PP	104

PARK NAME	TYPE	PARK #
FOSSLI	RA	106
FRENCH BEACH	PP	107
FRY CREEK CANYON	PP	108
GABRIOLA SANDS	PP	109
GARDEN BAY MARINE	PP	110
GARIBALDI	PP	111
BLACK TUSK nca	PP	111
GIBSON MARINE	PP	112
GITNADOIX RIVER	RA	113
GOLDEN EARS	PP	114
GOLDPAN	PP	115
GOLDSTREAM	PP	116
GREEN INLET MARINE	PP	116A
GORDON BAY	PP	117
GREEN LAKE	PP	118
GROHMAN NARROWS	PP	119
GWILLIM LAKE	PP	120
HAKAI	RA	121
HALKETT BAY MARINE	PP	122
HARMONY ISLANDS MARINE	PP	122A
HAMBER	PP	123
HAYNES POINT	PP	124
HELLIWELL	PP	125
HEMER	PP	126
HERALD	PP	127
HORNE LAKE CAVES	PP	128
HORSEFLY LAKE	PP	129
INDIAN ARM MARINE	PP	131
INKANEEP0	PP	132
JACKSON NARROWS MARINE	PP	132A
ISLE-DE-LIS MARINE	PP	134
JAMES CHABOT	PP	135
JIMSMITH LAKE	PP	137
JOFFRE LAKES	RA	138
JOHN DEAN	PP	139
JOHNSTONE CREEK	PP	140
JUNIPER BEACH	PP	141
KAKWA	RA	142
KALAMALKA LAKE	PP	143
KAWKAWA LAKE	PP	144
KEKULI BAY	PP	145
KENTUCKY-ALLEYNE	PP	146
KEREMEOS COLUMNS	PP	147
KETTLE RIVER	RA	148
KICKININEE	PP	149
KIKOMUN CREEK	PP	150
KILBY	PP	151
KINASKAN LAKE	PP	152
KING GEORGE VI	PP	153
KISKATINAW	PP	154
KLEANZA CREEK	PP	155
KOKANEE CREEK	PP	156
KOKANEE GLACIER	PP	158
KOKANEE GLACIER	RA	158
KOKSILAH RIVER	PP	159
KOOTENAY LAKE SITES	PP	160
KWADACHA WILDERNESS	PP	161
KWADACHA	RA	161A
LAC LA HACHE	PP	162
LACLE JEUNE	PP	163
LAKE LOVELY WATER	RA	164
LAKELSE LAKE	PP	165
LIARD RIVER HOTSPRINGS	PP	166
LITTLE QUALICUM FALLS	PP	167
LOCKHART BEACH	PP	168
LOON LAKE	PP	169
LOSS CREEK	PP	170
LOVELAND BAY	PP	171
MABEL LAKE	PP	172
MACMILLAN	PP	173
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MANSON LANDING MARINE	PP	175
MAQUINNA	PP	176
MARA	PP	177
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MEMORY ISLAND	PP	184
MEZIADIN LAKE	PP	185
MIRACLE BEACH	PP	186
MITLENATICH ISLAND NATURE	PP	187
MOBERLY LAKE	PP	188
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MONCK	PP	190
MONKMAN	PP	191
MONTAGUE HARBOUR MARINE	PP	192
MONTE LAKE	PP	193
MORDEN COLLIERY	PP	193A
MORRISSEY	PP	194
MORTON LAKE	PP	195
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MOUNT ASSINIBOINE	PP	197
MOUNT EDZIZA	PP	198
MOUNT EDZIZA	RA	198
MOUNT JUDGE HOWAY	PP	200
MOUNT MAXWELL	PP	201
MOUNT ROBSON	PP	202
MOUNT SEYMOUR	PP	203
MOUNT TERRY FOX	PP	204
MOYIE LAKE	PP	205
MUNCHO LAKE	PP	206
MURRIN	PP	207
NAIKOON	PP	208
NAIRN FALLS	PP	209
NANCY GREENE	PP	210
NANCY GREENE	RA	211

PARK NAME	TYPE	PARK #
NEWCASTLE ISLAND MARINE	PP	212
NICKEL PLATE	PP	213
NICOLUM RIVER	PP	214
NISKONLITH LAKE	PP	215
NORBURY LAKE	PP	216
NORTH THOMPSOM RIVER	PP	217
OCTOPUS ISLANDS MARINE	PP	218
OKANAGAN FALLS	PP	219
OKANAGAN LAKE	PP	220
OKANAGAN MOUNTAIN	PP	221
OLIVER COVE MARINE	PP	221A
OKEOVER ARM	PP	222
OLE JOHNSON	PP	223
ONE FIFTEEN CREEK	PP	224
ONE ISLAND LAKE	PP	225
OTTER LAKE	PP	226
PAARENS BEACH	PP	227
PAUL LAKE	PP	228
PEACE ARCH	PP	229
PENROSE ISLAND MARINE	PP	229A
BABINE LAKE MARINE (SITES)	PP	230
PENNASK LAKE	PP	231
PETROGLYPH	PP	232
PILOT BAY	PP	233
PINNACLES	PP	234
PIRATES COVE MARINE	PP	235
PLUMPER COVE MARINE	PP	236
PORPOISE BAY	PP	237
PORTEAU COVE	PP	238
PREMIER LAKE	PP	239
PRINCESS LOUISA MARINE	PP	240
PRINCESS MARGARET MARINE	PP	241
PRIOR CENTENNIAL	PP	242
PROPHET RIVER	RA	243
PRUDHOMME LAKE	PP	244
PUNTCHESAKUT LAKE	PP	245
PURCELL WILDERNESS	PP	246
PURDEN LAKE	PP	247
PURE LAKE	PP	248
RAFT COVE	PP	249
RATHTREVOR BEACH	PP	250
REARGUARD FALLS	PP	251
REBECCA SPIT MARINE	PP	252
RED BLUFF	PP	253
ROBERTS CREEK	PP	254
ROBERTS MEMORIAL	PP	255
RODERICK HAIG-BROWN	PP	256
ROLLEY LAKE	PP	257
ROSCOE BAY	PP	258
ROSEBERY	PP	259
ROSEWALL CREEK	PP	260
ROSS LAKE	PP	261
RUCKLE	PP	262
RUGGED POINT MARINE	PP	263
RUTH LAKE	PP	264
SALTERY BAY	PP	265
SANDWELL	PP	266
SANDY ISLAND MARINE	PP	267
SARGEANT BAY	PP	268
SASQUATCH	PP	269
SAVONA	PP	270
SCHOEN LAKE	PP	271
SECHELT INLETS MARINE	PP	272
SEELEY LAKE	PP	273
SHANNON FALLS	PP	274
SHUSWAP LAKE	PP	275
CELISTA (SHUSWAP LAKE)	PP	275A
SHUSWAP LAKE MARINE (SITES)	PP	276
SIDNEY SPIT MARINE	PP	277
SILVER BEACH	PP	278
SILVER LAKE	PP	279
SILVER STAR	PP	280
SIMSON MARINE	PP	281
SIR ALEXANDER MACKENZIE	PP	282
SKAGIT VALLEY	RA	283
SKIHIST	PP	284
SKOOKUMCHUCK NARROWS	PP	285
SMELT BAY	PP	286
SMUGGLER COVER MARINE	PP	287
SOOKE MOUNTAIN	PP	288
SOOKE POTHOLES	PP	289
SOWCHEA BAY	RA	290
SPAHATS CREEK	PP	291
SPATSIZI PLATEAU WILDERNESS	PP	292
SPECTACLE LAKE	PP	293
SPIDER LAKE	PP	295
SPROAT LAKE	PP	296
SQUITTTY BAY MARINE	PP	297
ST. MARY'S ALPINE	PP	298
STAGLEAP PROV. PARK	PP	299
STAKE-McCONNELL LAKES	RA	300
STAMP FALLS	PP	301
STEMWINDER	PP	302
STIKINE RIVER	RA	303
STONE MOUNTAIN	PP	304
STRATHCONA (INCUDES NCA)	PP	305
STUART LAKE	PP	306
SUDETEN	PP	307
SUKUNKA FALLS	PP	308
SUMAS MOUNTAIN	PP	309
SUNNYBRAE	PP	310
SUN-OKA BEACH	PP	311
SWAN LAKE	PP	312
SYRINGA CREEK	PP	313
TATLATUI	PP	314
TAYLOR ARM	PP	315

PARK NAME	TYPE	PARK #
TAYLOR LANDING	PP	316
TEAKERNE ARM MARINE	PP	317
TEN MILE LAKE	PP	318
TETSA RIVER	PP	319
TEXAS CREEK	PP	320
THUNDER HILL	PP	321
THURSTON BAY MARINE	PP	322
TOP OF THE WORLD	PP	323
TOPLEY	PP	324
TRIBUNE BAY	PP	325
TROUT LAKE	PP	326
TRUMAN DAGNUS LOCHEED	PP	327
TUDYAH LAKE	PP	328
TWEEDSMUIR (INCLUDES NCA)	PP/RA	329
TYHEE LAKE	PP	330
VALHALLA	PP	331
VASEAUX LAKE	PP	332
VICTOR LAKE	PP	333
WALLACE ISLAND MARINE	PP	334
WALLOPER LAKE	PP	335
WALSH COVE MARINE	PP	336
WARDNER	PP	337
WASA LAKE	PP	338
WELLS GRAY (SITES)	PP	339
WELLS GRAY	RA	339
WEST LAKE	PP	340
WEST SHAWNIGAN LAKE	PP	341
WHALEBOAT ISLAND MARINE	PP	342
WHISKERS POINT	PP	343
WHITE PELICAN	PP	344
WHITESWAN LAKE	PP	345
WINTER COVE MARINE	PP	346
WISTARIA	PP	347
WOKKPASH	RA	348
YAHK	PP	349
YARD CREEK	PP	350
BEAVER POINT	PP	351
BLACKCOMB GLACIER	PP	352
BRIGHT ANGEL	PP	353
CEDAR POINT	PP	354
COTTONWOOD RIVER	PP	355
DEAD MAN'S ISLAND	PP	356
ELKO	PP	357
ERIE CREEK	PP	358
EVES	PP	359
FERRY ISLAND	PP	360
GARDOM LAKE	PP	361
HYLAND RIVER	PP	362
INONOAKLIN	PP	363
JEWEL LAKE	PP	364
KIN BEACH	PP	365
KITTY COLEMAN BEACH	PP	366
KLEDO CREEK	PP	367
MARA POINT	PP	368
MARL CREEK	PP	369
ROCK CREEK	PP	370
RYAN	PP	371
SAGAR LAKE	PP	372
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